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Research paper

Differential access to syringe exchange and other prevention activities among people who inject drugs in rural and urban areas of Puerto Rico

Melissa Welch-Lazoritz[a,*], Patrick Habecker[b], Kirk Dombrowski[a], Angelica Rivera Villegas[c], Carmen Ana Davila[c], Yadira Rolón Colón[d], Sandra Miranda De León[d]

[a] 206 Benton Hall, University of Nebraska-Lincoln, Lincoln, NE 68588, United States
[b] 216 Benton Hall, University of Nebraska-Lincoln, Lincoln, NE 68588, United States
[c] University of Nebraska-Lincoln, 63 Calle Jose de Diego, Cidra, PR 00739, United States
[d] Puerto Rico Department of Health, P.O. Box 70184, San Juan, PR 00936-8184, United States

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ABSTRACT

Background: Injection drug use and its associated blood-borne infections has become a rapidly increasing problem in rural areas of the US recently. Syringe exchange programs have been shown to be effective for reducing transmission of blood borne infections, however access to these prevention efforts may be limited in rural areas.

Methods: This paper utilizes two separate community samples of people who inject drugs (PWID) in Puerto Rico to achieve the following research objectives: (1) compare rural and urban access to syringe exchange programs, free sterile syringes and other HIV/HCV prevention activities, and (2) examine whether utilization of prevention activities is associated with lower injection risk behaviors. Two samples were recruited with RDS (n = 315 rural sample; n = 512 urban sample) and included adults aged 18 years and older who have injected drugs within the past month.

Results: 78.5% of the urban sample utilized a syringe exchange program in the past year, compared to 58.4% of the rural sample ($p < .001$). 71.4% of the urban sample received free sterile needles, compared to 58.4% of the rural sample ($p < .001$). 66% of the urban sample received free works compared to 59% of the rural sample ($p = .034$). 29% of urban PWID had a conversation with an outreach worker about HIV prevention compared to 18% of the rural sample ($p < 0.001$). Receiving free needles significantly increases the frequency of using a sterile needle to inject ($p < .001$).

Conclusion: Urban PWID were significantly more likely to have utilized syringe exchange programs, received free sterile needles, received free works, and to have talked about HIV prevention with an outreach worker during the past year than PWID residing in rural areas. Individuals who accessed these prevention activities were significantly less likely to exhibit risky injection behavior. Policy implications call for increasing access to prevention services in rural areas to reduce disease transmission.

Introduction/lit review

In the United States, injection drug use and the associated blood-borne infections have traditionally been considered an urban problem, considering nearly all of the scientific research on injection drug use and its related harms come from large urban areas (National Research Council and Institute of Medicine Panel on Needle Exchange and Bleach Distribution, Normand, Vlahov, & Moses, 1995) although researchers have emphasized that rural drug use and its harms require greater attention (Dombrowski, Crawford, Khan, & Tyler, 2016). However, in 2015 this view began to shift as new HIV and Hepatitis C (HCV) outbreaks emerged, revealing widespread rural drug injection—the most public of which occurred in Scott County, Indiana (Harper, 2015; Peters et al., 2016; Strathdee & Beyrer, 2015). Between 2010 and 2013, HCV infections have risen 150% nationwide, with the largest increases (up to 364%) seen in rural areas (Centers for Disease Control & Prevention, 2016; Suryaprasad et al., 2014; Whalen, 2015). Injection drug use continues to be an important factor driving the spread of HIV and Hepatitis C (HCV) in the United States as a whole, and especially in Puerto Rico, where injection drug use was the exposure category for almost half of accumulated AIDS cases

* Corresponding author.
E-mail address: Mwelch2@unl.edu (M. Welch-Lazoritz).

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and more than one-fourth of HIV diagnoses between 2005–2011 (Miranda De León, Marrero Cajigas, Rolón Colon, & López Alvarado, 2011). Pérez, Torres, Roman, & Colon (2005) found lifetime cocaine and lifetime heroin use to be significant predictors of HCV prevalence in a sample of the general population (aged 21–64) in San Juan, PR. The shared use of injection equipment (including syringes, cookers, and cotton) is often responsible for these transmissions (Abadie, Welch-Lazoritz, Gelpi-Acosta, Reyes, & Dombrowski, 2016; Hagan et al., 2001). One method for abating the transmission of blood borne illnesses through drug use are syringe exchange programs (SEPs) which provide people who inject drugs (PWID) with sterile injection equipment (López et al., 2014).

Syringe exchange programs (also known as Needle Syringe Programs, as not all syringe exchange programs actually require an exchange) have been shown to be effective for preventing HIV risk behaviors and reducing transmission of HIV and viral Hepatitis. A 2013 systematic review found considerable evidence for the effectiveness of population level syringe coverage (where 10 or more syringes per PWID are distributed for free to at least 50% of the injecting population per year) on reducing HIV/HCV prevalence and incidence. In a 2001 meta-analysis which included syringe exchange programs of all sizes, Gibson, Flynn, and Perales (2001) found positive effects associated with syringe exchange programs in 28 of 42 studies, while 2 studies found negative associations and 14 found either no association or mixed results.

Unfortunately, access to syringe exchange programs and other public health campaigns aimed at reducing the health risks of injection drug use are scarce in rural areas (Centers for Disease Control & Prevention, 2015). In 2015 the CDC reported that only 20% of syringe exchange programs serve rural areas and rural SEPs operate under smaller budgets (average rural budget was $26,023, mean # of syringes exchanged was 91,536, which calculates to exchanging 3.5 syringes per $1 spent) than SEPs serving urban areas (average urban budget was $184,738, mean # of syringes exchanged was 305,694, which calculates to exchanging 1.65 needles per $1 spent) (Centers for Disease Control & Prevention, 2015). Rural areas also lack coverage for other prevention activities, such as counseling. According to the director of the CDC's National Center for HIV/AIDS, Viral Hepatitis, STD, and TB prevention Jonathan Mermin, "In many urban settings in the U.S., people who inject drugs have had years of preventative counseling and messaging and know how to protect themselves, yet in rural areas, many may not have received counseling and it presents a problem" (Whalen, 2015). The sentiment that HIV testing, counseling, and drug use education programs are lacking in rural areas, and that this is a key contributor to the spread of these diseases, has been echoed by scientific researchers in an explanation of the recent outbreak in rural Indiana (Peters et al., 2016; Strathdee & Beyrer, 2015) and in an overall assessment of drug-related harms in rural areas (Dombrowski et al., 2016).

The current paper examines differences between urban and rural people who inject drugs using two community samples from both rural and urban areas of Puerto Rico to assess (1) access to free sterile syringes and other HIV/HCV prevention activities, and (2) risk behaviors of those who did and did not access prevention activities.

Methods

This paper utilizes data from two separate samples of injection drug users in Puerto Rico. The *rural sample* consists of 315 injection drug users residing in four rural towns in the mountainous region of central Puerto Rico, about 40 miles from San Juan. The Injection Risk Networks in Rural Puerto Rico project completed interviews between April 2015 and June 2015. Sample recruitment was managed using respondent driven sampling (RDS) whereby eight "seed respondents" were chosen to serve as the first participants, then participants who completed the survey were given three referral coupons they could pass out to other PWID they knew and who had not previously participated in the study. Every eligible referral earned the recruiter an additional $10. Upon completion of the questionnaire participants were given $25. These four towns were chosen due to the presence of a syringe exchange program operating in this rural region in Puerto Rico, collaboration with whom facilitated seed selection—all eight seeds were identified by their participation in the rural syringe exchange program. Participants were 18 years of age or older, alert at the time of the interview, and active injection drug users (injected drugs within the last 30 days). The study received IRB approval through the University of Nebraska-Lincoln (IRB# 20131113844FB) and the University of Puerto Rico School of Medicine (IRB# A8480115).

The *urban sample* consists of 512 injection drug users residing in San Juan, Puerto Rico and the surrounding metropolitan area who participated in the CDC's National HIV Behavioral Surveillance (NHBS) cycle among persons who report injection drug use (IDU) Round 3 study. The NHBS IDU 3 study completed interviews between August 2012 and December 2012. Sample recruitment was also managed using Respondent Driven Sampling, whereby participants who completed the survey were given three referral coupons that they could pass out to other PWID they knew who had not previously participated in the study. NHBS participants were compensated with $25 for the interview and $10 for each referral.

Both the urban and rural questionnaires were very similar, the Injection Risk Networks in Rural Puerto Rico project interview was based off of the CDC NHBS IDU Round 3 Questionnaire version 13, and all measures analyzed in the current paper were exactly the same for rural and urban participants. In addition to demographic variables, this questionnaire collected information about type and frequency of drug use, as well as HIV and HCV risk behaviors such as sharing of needles, cookers, cotton, and water, and utilization of prevention activities. The existence of these two samples, one collected as part of the CDC's National HIV Behavioral Surveillance project, Injection Drug User Round 3, in urban San Juan, and the other, collected in rural areas surrounding San Juan in Puerto Rico as part of a NIDA funded project aimed at understanding risk networks in rural areas, provide a unique opportunity to compare data from rural and urban areas of the same geographic region at similar points in time.

Measures

Utilized syringe exchange program was assessed with the question "in the last 12 months when you injected, did you get your needles at any of the following places . . . Needle exchange program?" with responses of (0) no or (1) yes. *Received free needles* was assessed using the "in the past 12 months, have you gotten any new sterile needles for free, not including those given to you by a friend, relative, or sex partner?" with responses of (0) no or (1) yes. These two measures, *utilized syringe exchange program* and *received free needles* are very similar and include overlap (n = 463 responded "yes" to both), but both are included to add specificity to this paper. The *utilized syringe exchange program* measure has more item non-response (total n = 746) than *received free needles* and asked specifically about syringe exchange programs. However, the *received free needles* (total n = 770) measure includes syringes received from syringe exchange programs as well as syringes received other outreach efforts (excludes syringes from peers). *Received free works* was assessed using a similarly structured question "in the past 12 months, have you gotten any new cookers, cotton, or water for free, not including those given to you by a

friend, relative, or sex partner?" with the response choices of (0) no or (1) yes. *Talked about HIV Prevention* was a measure asking "in the past 12 months, have you had a one-on-one conversation with an outreach worker, counselor, or prevention program worker about ways to prevent HIV?" with the response choices of (0) no or (1) yes.

Frequency of injection was assessed using the question "in the last 12 months, on average, how often did you inject drugs?" with response choices of (1) one time per month, (2) 2–3 times per month, (3) one time per week, (4) 2–6 times per week, (5) one time per day, and (6) more than once per day. *Years spent injecting* is a measure calculated by subtracting the age a participant first began injecting drugs from their age at the time of the survey.

Past year frequency of sharing a used needle (*a*), *sharing a used cooker* (*b*), *and sharing a used cotton* (*c*), are three categorical measures asking how often, in the past year, the participant used (a) needles that someone else had already injected with, (b) a cooker that someone else had already used, and (c) a cotton that someone else had already used. The response options are: never (coded as 0), rarely (coded as 1), about half of the time (coded as 2), most of the time (coded as 3), and always (coded as 4). *Past year frequency of injecting with a sterile needle*, asks how often in the past year the respondent used a new, sterile needle to inject, with the same response options of never (coded as 0), rarely (coded as 1), about half of the time (coded as 2), most of the time (coded as 3), and always (coded as 4). Risk behavior is measured using two yes (1) or no (0) questions "the last time you injected with someone, did you use a new sterile needle to inject?" and "the last time you injected with someone, did you use drugs that had been divided with a syringe that anyone else had already injected with?" as the measures *last time injected: sterile needle use* and *last time injected: shared divided drugs.*

Analytic approach

The results reported in this analysis stem from merging the two datasets (urban and rural) and analyzing them as one sample. The RDS suggested weights for the variables examined in Tables 2–6 (our focal variables) fall within the bootstrap error estimates, suggesting that for these variables, weight-based corrections for peer referral sampling bias were unnecessary, and therefore they were not used. We conducted t-tests (for continuous variables) and one-way ANOVA tests (for categorical or dichotomous variables) to compare the means of participants from the rural sample to participants from the urban sample (Table 1). Multivariate analyses using logistic regression were used to further evaluate the differences in use of prevention activities shown in the comparison of means tests. We conducted three logistic regression models with rural/urban as the exposure variable, controlled for past year average frequency of injection, and utilized a syringe exchange program (model 1), receipt of free needles (model 2), receipt of free works kits (model 3), and discussion of HIV prevention (model 4) as the outcomes (Table 2). Additionally, logistic regression analyses explored the effects of utilizing prevention activities, like receiving free needles (Table 3), receiving free works kits (Table 4), discussing HIV prevention with an outreach organization (Table 5), and utilizing a syringe exchange program (Table 6) as exposure variables, on injection risk behaviors as outcomes, which could propagate disease transmission. All analyses were conducted using IBM SPSS Statistics software.

Results

Table 1 shows a comparison of means between the rural sample and the urban sample. These two samples report significantly different utilization of syringe exchange programs—78.5% of the urban sample and 58.4% of the rural sample utilized a syringe exchange program in the past year ($p < .001$). Exactly 71.4% of the urban sample reported receiving free sterile needles in the past year, compared to 58.4% of the rural sample ($p < .001$). Two-thirds (66%) of the urban sample received free works during the past year compared to 59% of the rural sample ($p = .034$). Approximately one-third (29%) of urban PWID had a conversation with an outreach worker about HIV prevention compared to 18% of the rural sample ($p < 0.001$).

Logistic regression results (Table 2) show that the odds of urban injection drug users obtaining needles from a syringe exchange program are 2.4 times greater ($p < .000$) than the odds of rural injection drug users obtaining needles from a syringe exchange program in the past year, controlling for injection frequency. Similarly, the odds of urban injection drug users receiving free

Table 1
Sample means comparisons.

	Urban (*max n* = 512)	Rural (*max n* = 315)	N
Age (years)	41.1	41.8	816
Annual Income less than $4,999	91.4%	80.1%	765
Age at first use of injection drugs	20.6*	21.9*	769
# of years spent injecting drugs	20.1	19.9	765
Past year:			
Frequency of injection	5.8***	5.5***	770
Utilized syringe exchange program (% yes)	78.5%***	58.4%***	746
Received free needles (% yes)	71.4%***	58.7%***	770
Received free works (% yes)	66.2%***	58.7%***	767
Discussed HIV prevention (% yes)	29.0%***	18.1%***	770
Frequency of sharing a used needle	0.7***	0.4***	770
Frequency of sharing a used cooker	1.0	1.1	770
Frequency of sharing a used cotton	0.9	0.7	770
Frequency of sterile needle use	3.0***	2.7***	770
Last injection: sterile needle used	87.1%	81.6%	365
Last injection: shared a used needle	41.3%	32.4%	352
Last injection: shared divided drugs	64.8%	47.2%	338

*p<.05.
**p<.01.
***p<.001.

Table 2
Logistic regression predicting past year utilization of various prevention activities.

	Utilized syringe exchange program (N = 746) Exp(B)	Received free needles (N = 770) Exp(B)	Received free works kits (N = 767) Exp(B)	Discussed HIV prevention (N = 770) Exp(B)
Past year freq. of injection	1.231*	1.283**	1.291**	0.903
Urban (1)/rural (0)	2.439***	1.628**	1.271	1.917***
Constant	0.449	0.362*	0.350*	0.386†

† p<.10.
* p<.05.
** p<.01.
*** p<.001.

Table 3
Regressions predicting past year injection risk behaviors (received free needles).

	Freq. share used needle (N = 769) B	Freq. share used cooker (N = 769) B	Freq. share used cotton (N = 769) B	Freq. sterile needle use (N = 769) B	Last inject sterile needle (N = 365) Exp(B)	Last inject shared used needle (N = 352) Exp(B)	Last inject shared divided drugs (N = 338) Exp(B)
Past year freq. of injection	0.068†	0.060	0.018	−0.109*	0.381*	0.946	1.244
Rural (0)/urban (1)	0.275***	−0.61	0.123	0.357***	1.534	1.516†	2.234**
Received free needles	−0.129†	0.014	−0.011	0.292**	1.579	0.906	0.587*
Constant	0.097	0.721*	0.648*	3.083***	923.26**	0.688	0.349

† p<.10.
* p<.05.
** p<.01.
*** p<.001.

needles are 1.6 times greater ($p < .002$) than the odds of rural injection drug users receiving free needles in the past year, controlling for injection frequency. Urban injection drug users have 1.9 times higher odds than rural users of talking to an outreach worker about HIV prevention during the past year, controlling for frequency of injection ($p < .001$).

Clearly, PWID residing in the metropolitan San Juan area have better access to formal prevention activities, like syringe exchange programs, outreach services that provide free needles and works kits, and outreach workers who discuss HIV prevention. Table 3 examines whether individuals who accessed these outreach services engage in fewer risky injection behaviors that could transmit blood-borne illnesses in Puerto Rico. Regression results in Table 3 show the effects of receiving free needles on a variety of risk behaviors. We found that individuals who received free needles have a marginally lower frequency of sharing used needles, controlling for frequency of injection and urban/rural sample ($p < .063$). Similarly, those who received free needles have a significantly higher frequency of using a sterile needle to inject ($p < .001$). Participants who received free needles were also significantly less likely to report sharing divided drugs the last time they injected with someone else, controlling for frequency of injection and urban/rural sample ($p < .038$).

Receiving free works kits during the past year is also significantly associated with some safer injection practices (Table 4). Individuals who received free works kits used a sterile

Table 4
Regressions predicting past year injection risk behaviors (received free works kits).

	Freq. share used needle (N = 766) B	Freq. share used cooker (N = 766) B	Freq. share used cotton (N = 766) B	Freq. sterile needle use (N = 766) B	Last inject sterile needle used (N = 362) Exp(B)	Last inject shared used needle (N = 350) Exp(B)	Last inject shared divided drugs (N = 337) Exp(B)
Past year freq. of injection	0.063†	0.058	0.015	−0.104*	0.380*	0.967	1.224
Urban (1)/ rural (0)	0.267***	−0.068	0.114	0.379***	1.605	1.499	2.167**
Received free works kits	−0.051	0.063	0.055	0.231**	1.477	0.759	0.675
Constant	0.078	0.707*	0.630*	3.099***	951.0**	0.686	0.348

† p<.10.
* p<.05.
** p<.01.
*** p<.001.

Table 5
Regressions predicting past year injection risk behaviors (discussed HIV prevention).

	Freq. share used needle (N = 769)	Freq. share used cooker (N = 769)	Freq. share used cotton (N = 769)	Freq. sterile needle use (N = 769)	Last inject sterile needle used (N = 365)	Last inject shared used needle (N = 352)	Last inject shared divided drugs (N = 338)
	B	B	B	B	Exp(B)	Exp(B)	Exp(B)
Past Year freq. of injection	0.057	0.059	0.015	−0.085†	0.408*	0.938	1.164
Urban (1)/ rural (0)	0.282**	−0.047	0.139	0.346***	1.539	1.508†	2.196**
Discussed HIV prevention	−0.181*	−0.110	−0.150	0.373***	2.196†	0.811	0.440**
Constant	0.115	0.755*	0.688*	3.055***	713.95**	0.716	0.443

† p<.10.
* p<.05.
** p<.01.
*** p<.001.

needle to inject more frequently than those who did not receive works kits, controlling for frequency of injection and urban/rural sample ($p < .004$).

Table 5 shows that individuals who discussed HIV prevention with an outreach worker shared a used needle ($p < .017$) less frequently and used a sterile needle to inject more frequently than those who did not discuss HIV prevention with an outreach worker, controlling for frequency of injection and urban/rural sample ($p < .001$). Participants who discussed HIV prevention with an outreach worker had marginally 2 times greater odds of having used a sterile needle the last time they injected with someone else ($p < .053$) and they had lower odds of sharing divided drugs the last time they injected with someone else, compared to those who had not discussed HIV prevention, controlling for frequency of injection and urban/rural sample ($p < .002$).

Table 6 shows that individuals who utilized a syringe exchange program in the past year used a new, sterile needle to inject more frequently than those who did not patronize a syringe exchange program ($p < .000$), controlling for frequency of injection and urban/rural sample. Those who utilized a syringe exchange program also had lower odds of sharing divided drugs the last time they injected with someone else, compared to those who had not gotten needles from a syringe exchange program, controlling for frequency of injection and urban/rural sample ($p < .022$).

Discussion

This study provides evidence that access to syringe exchange programs is deficient in rural areas of Puerto Rico. We found that injection drug users who reside in urban areas were 2.4 times more likely to get needles from a syringe exchange program, 1.6 times more likely to receive free sterile needles, and 1.9 times more likely to talk to an outreach worker about HIV prevention than rural users. This situation is likely similar for many other rural areas across the country, as evidenced by the lack of funding for rural syringe exchange programs (Centers for Disease Control & Prevention, 2016; Whalen, 2015). As of March 2014, there were only 34 nonurban (20 rural and 14 suburban) syringe exchange programs operating in the entire United States (including territories) and until January 2016, there had been a long-standing ban on federal funding for syringe exchange programs (Centers for Disease Control & Prevention, 2015, p. 20; McEvers, 2016). While federal funds still cannot be used to fund actual sterile syringe purchases, they can now be used to pay for staff employed at SEPs (McEvers, 2016). This is especially important for rural SEPs, considering only 40% reported having full-time personnel in 2015, so this legislation change could enable them to hire more employees (Centers for Disease Control & Prevention, 2015).

Lack of access to syringe exchange and other prevention programs in rural areas could contribute to the possibility of future HIV/HCV outbreaks, as the outbreak recently seen in Scott County, Indiana has been attributed in part to the non-existence of syringe exchange programs (Peters et al., 2016; Strathdee & Beyrer, 2015). Our results provide substantial evidence that accessing free sterile syringes and works reduces risky injection behaviors that have been linked to the spread of HIV and hepatitis, and in turn reduces disease transmission on the island.

In addition, state laws can limit access to syringes and willingness for PWID to purchase and carry syringes. The data for this study come from Puerto Rico, a U.S. territory which amended

Table 6
Regressions predicting past year injection risk behaviors (utilized syringe exchange program).

	Freq. share used needle (N = 745)	Freq. share used cooker (N = 745)	Freq. share used cotton (N = 745)	Freq. sterile needle use (N = 745)	Last inject sterile needle used (N = 355)	Last inject shared used needle (N = 339)	Last inject shared divided drugs (N = 330)
	B	B	B	B	Exp(B)	Exp(B)	Exp(B)
Past year freq. of injection	0.054	0.047	0.014	−0.102*	0.406*	0.946	1.213
Urban (1)/ rural (0)	0.310***	−0.010	0.164†	0.307***	1.447	1.786*	2.725***
Utilized syringe exc. prog.	−0.085	−0.026	−0.065	0.355***	1.280	0.568	0.515*
Constant	0.119	0.758*	0.677*	3.024***	761.66*	0.582	0.386

† p < .10.
* p < .05.
** p < .01.
*** p < .001.

their 1997 paraphernalia law ("Ley Num. 110 del ano 1997," n.d.) to exclude the possession of syringes in 2007 ("Ley Num. 73 del año 2007," n.d.) and does not require a prescription to purchase syringes in a pharmacy (Burris, n.d.-b). Other states with large rural areas, like Indiana, Iowa, Nebraska, and Oklahoma, have drug paraphernalia laws that make it illegal to carry syringes (even new, sterile syringes) or cookers and serve as a deterrent to purchasing or obtaining a sufficient supply of sterile injecting equipment (Burris, n.d.-a). Furthermore, until May 2015, Syringe Exchange Programs were illegal in the state of Indiana but this changed in response to the HIV and Hepatitis C outbreak in rural areas of the state (Harper, 2015). The passage of this law allowed counties in Indiana to apply for permission to operate Syringe Exchange Programs under a one-year provision—this has since been extended for another year to allow legal SEP operation until May 2017 (Rudavsky, 2016). Four counties in Indiana have instituted needle exchange programs and these have widely been considered successful (Rudavsky, 2016). According to Dr. Kevin Rogers, Scott County's health officer, the syringe exchange program has "significantly reduced potential harm to our community, dramatically decreased new cases of HIV and hepatitis C, and given health care providers better and regular access to our citizens, who desperately need medical services" (Rudavsky, 2016). Rural states and territories should consider amending laws that limit the purchase/acquisition of or prosecute the possession of safe injection materials in order to protect public health. In addition, communities with rising rates of injection drug use, HIV, viral hepatitis, or overdose deaths should consider opening supervised injection facilities. In North America, supervised injection facilities have been historically controversial but the city of Vancouver in British Columbia, Canada opened one in 2003 in an effort to improve public health amid an HIV epidemic (Vancouver Coastal Health, 2014). Independent evaluation of Vancouver's supervised injection facilities found that use of the facility reduced syringe sharing, reduced syringe lending by HIV-infected IDU, and reduced syringe borrowing among HIV-negative IDU (Wood, Tyndall, Montaner, & Kerr, 2006). The supervised injection facility in Vancouver is still the only one in North America, but the city of Ithaca, New York has proposed opening one pending state approval (Foderaro, 2016).

Limitations

This study is limited by the rural sample's association with the only rural syringe exchange program. Access to syringe exchange programs in rural Puerto Rico is likely even lower than our numbers indicate, because all of the seed respondents that began recruitment chains for the rural sample were clients of the rural SEP, El Punto en la Montaña and the four rural towns sampled in this study were chosen due to their access to this SEP. In addition, the study is limited by the data from the two samples being collected at two separate time points, approximately two years apart (although no major secular trends occurred during this time gap that we are aware of). This study is further limited by the past year measurement of obtaining free syringes and works—this is a large time frame, only dichotomous measures, and accessing syringes once does not necessarily mean that a person is obtaining a sufficient supply of sterile syringes. Future studies should consider more sensitive SEP measures, such as past month SEP use, frequency of SEP use, or an estimate of syringe coverage (the number of syringes obtained from SEPs in the past month compared to the number of self-reported injections in the past month). Despite these limitations, this paper still finds substantial evidence for increasing the number of prevention or outreach services available to people who inject drugs in rural areas.

Conclusion

Access to prevention activities, like syringe exchange programs that also provide free injection equipment and HIV/HCV counseling, needs to be expanded in rural areas. In addition, rural areas in many mainland states of the U.S. should expand access to syringe exchange programs and amend laws paraphernalia laws to encourage the use of clean, sterile needs. This can prevent devastating disease epidemics, like those seen in rural Indiana, from happening in other rural counties in the future.

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Conflict of interest

None of the authors (Welch-Lazoritz, Habecker, Dombrowski, Rivera, Davila, Rolon Colon, & Miranda de Leon) have any conflicts of interest related to this research that could affect their objectivity.

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